

CLAIMS:

1. A torque applying tool comprising a torque wrench or nutrunner having handle means and a drive head for torque output, and means for sensing the output torque applied by the drive head;

wherein the drive head is located at one end of a hollow quill shaft an outer diameter of which is splined to receive a torque drive input from the handle at a location axially spaced from the drive head;

a central shaft extends from the drive head up the hollow center of the quill shaft; and

the ends of the hollow quill shaft and the central shaft remote from the drive head mount opposite ends of a flexible cantilever beam on a face of which or on opposed faces of which are mounted one or more strain sensing transducers the output or outputs of which represent sensed torque applied by the drive head.

2. A tool according to claim 1, wherein the tool comprises two of the strain sensing transducers mounted on opposed faces of the cantilever beam.

3. A tool according to claim 1, wherein the outputs of the one or more strain sensing transducers are transmitted by a radio frequency coupling between a rotary coupling element connected to the drive head and a non-rotary coupling element in the handle means.

4. A tool according to claim 3, wherein the output signal representing sensed torque applied by the drive head is transmitted from a patch antenna carried by the handle means and receiving as input the output from the non-rotary coupling element.

5. A tool according to claim 1, wherein each of the strain sensing transducers is a surface acoustic wave transducer.

6. A tool according to claim 1, wherein the tool is a nutrunner and torque drive input to the hollow quill shaft is provided through a bevel gear splined to the quill shaft at the location axially spaced from the drive head.

7. A tool according to claim 6, wherein motive power to the bevel gear is provided from a motor through a gearbox and another cooperating bevel gear.

8. A tool according to claim 1, wherein the tool is a torque wrench and torque drive input to the hollow quill shaft is provided through the handle means splined to the quill shaft at the location axially spaced from the drive head.

9. A torque applying tool comprising a torque wrench or nutrunner having handle means and a drive head for torque output, and means for sensing the output torque applied by the drive head;

wherein the drive head is located at one end of a hollow quill shaft an outer diameter of which is splined to receive a torque drive input from the handle at a location axially spaced from the drive head;

a central shaft extends from the drive head up the hollow centre of the quill shaft;

wherein the ends of the hollow quill shaft and the central shaft remote from the drive head mount opposite ends of a flexible cantilever beam on a face of which or on opposed faces of which are mounted one or more strain sensing transducers the output or outputs of which represent sensed torque applied by the drive head; and

the outputs of the one or more strain sensing transducers are transmitted to a non-rotary element in the handle means via slip rings or across an air gap.

10. A tool according to claim 9, wherein the outputs of the one or more strain sensing transducers are transmitted by a radio frequency coupling between a rotary coupling element connected to the drive head and the non-rotary coupling element in the handle means.

11. A tool according to claim 9, wherein each of the strain sensing transducers is a surface acoustic wave transducer.

12. A tool according to claim 9, wherein the output signal representing sensed torque applied by the drive head is transmitted from a patch antenna carried by the handle means and receiving as input the output from the non-rotary coupling element.

13. A tool according to claim 9, wherein the tool is a nutrunner and torque drive input to the hollow quill shaft is provided through a bevel gear splined to the quill shaft at the location axially spaced from the drive head.

14. A tool according to claim 13, wherein motive power to the bevel gear is provided from a motor through a gearbox and another cooperating bevel gear.

15. A tool according to claim 9, wherein the tool is a torque wrench and torque drive input to the hollow quill shaft is provided through the handle means splined to the quill shaft at the location axially spaced from the drive head.

16. A torque applying tool comprising a torque wrench or nutrunner having handle means and a drive head for torque output, and means for sensing the output torque applied by the drive head;

wherein the drive head is located at one end of a hollow quill shaft an outer diameter of which is splined to receive a torque drive input from the handle at a location axially spaced from the drive head;

a central shaft extends from the drive head up the hollow centre of the quill shaft;

wherein the ends of the hollow quill shaft and the central shaft remote from the drive head mount opposite ends of a flexible cantilever beam on a face of which or on opposed faces of which are mounted one or more strain sensing transducers the output or outputs of which represent sensed torque applied by the drive head;

wherein the outputs of the one or more strain sensing transducers are transmitted by a radio frequency inductive coupling between a rotary first induction coupling element connected to the drive head and a non-rotary second induction coupling element in the handle means; and

the output signal representing sensed torque applied by the drive head is transmitted from a patch antenna carried by the handle means and receiving as input the output from the second induction element or set of induction elements.

17. A tool according to claim 16, wherein each of the strain sensing transducers is a surface acoustic wave transducer

18. A tool according to claim 16, wherein the tool is a nutrunner and torque drive input to the hollow quill shaft is provided through a bevel gear splined to the quill shaft at the location axially spaced from the drive head.

19. A tool according to claim 16, wherein motive power to the bevel gear is provided from a motor through a gearbox and another cooperating bevel gear.

20. A tool according to claim 16, wherein the tool is a torque wrench and torque drive input to the hollow quill shaft is provided through the handle means splined to the quill shaft at the location axially spaced from the drive head.